EDGE TREATMENT PROCESS

FIELD OF THE INVENTION

[0001] The present invention relates generally to a method of precisely measuring and treating a circumferential edge of a part.

BACKGROUND OF THE INVENTION

[0002] It is often desirable in the manufacturing of various parts to subject the circumferential edges of the part to various edge treatment processes in order to finish or coat the outer edges thereof. These edge treatment processes include, but are not limited to priming, painting, coating, pre-coating, machining, grinding, sanding, polishing, thermal edge finishing, among others. These parts may include, for example, various rigid or semi-rigid materials such as ceramics, glass, laminates, veneers, composite materials, thermoplastic and/or thermosetting polymers, photosensitive materials or photocurable materials, wood, metal, metal alloys, and combinations of one or more of these materials, among others.

[0003] While the parts made from these materials may have a predetermined general shape and aspect ratio, the dimensions of the edges themselves may not be identical, making it difficult to quickly and accurately treat or finish circumferential edges of multiple parts without error. This is especially true in situations where the part may be a substantially planar sheet, veneer, ply, layer or other similar surface and in which the parts may have rounded edges that are not identical or may have cutouts or indentations or protrusions in one or more edges or sections therein and it is desirable to treat substantially the entire circumferential edge of the part rapidly and precisely. In other words, the tolerance of the part itself may be much greater than the edge treatment process can permit. By "circumferential edge" what is meant is the boundary edge or perimeter of the surface of the part.

[0004] Thus, it would be desirable to provide an improved process that would allow for precise measuring of the actual dimensions of the circumferential edge of a part having a predetermined general shape and aspect ratio and using this measured data to more accurately treat and/or process the circumferential edge of the surface of the part. In addition, it would also be desirable to provide an improved process for edge treating the circumferential edges of similarly sized and shaped parts where adjustments to a tool path can be made in a measuring step quickly and accurately prior to the treatment step. It would also be desirable to process a part with unknown edge shape by measuring the edge and then treating the measured edge. Finally, it would be desirable to provide an improved process in which the measuring, treating and/or processing steps may be executed on the same process machinery.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a method of accurately and precisely measuring and mapping a circumferential edge of a part.

[0006] It is another object of the present invention to provide a high speed precision edge finishing treatment of a measured circumferential edge of the part.

[0007] To that end, in one embodiment, the present invention relates generally to a method of treating a circumferential edge of a part having a predetermined general shape and aspect ratio, the method comprising the steps of:

[0008] a) generating a predicted tool path of the circumferential edge of the part based on the predetermined general shape and aspect ratio of the part;

[0009] b) mapping the circumferential edge of the part with a measuring device to measure a deviation between the predicted tool path and an actual part profile using the measuring device over at least substantially the entire circumferential edge of the part;

[0010] c) combining the predicted tool path with the measured deviation to determine a computed tool path; and

[0011] d) following the circumferential edge of the part with a treating device using the computed tool path, wherein the computed tool path represents the sum of the predicted tool path and the measured deviation,

[0012] wherein the circumferential edge of the part is measured and treated; and

[0013] wherein the computed tool path follows the circumferential edge of the part precisely to improve the accuracy of the edge treatment process.

[0014] In another embodiment, the present invention also relates generally to a method of treating a circumferential edge of a part having an unknown shape and dimensions, the method comprising the steps of:

[0015] a) mapping at least substantially the entire circumferential edge of the part with a measuring device to measure the part profile and create a computed tool path for the actual part profile; and

[0016] b) following the circumferential edge of the part with a treating device using the computed tool path,

[0017] wherein the circumferential edge of the part is measured and treated; and

[0018] wherein the computed tool path follows the circumferential edge of the part precisely to improve the accuracy of the edge treatment process.

[0019] In another embodiment, the present invention relates generally to a method of treating a series of circumferential edges of parts having similar shapes and dimensions, comprising the steps of:

[0020] a) obtaining a previous tool path of a circumferential edge of a part, wherein the previous tool path is one used in treating a previous work piece having a similar shape and dimensions;

[0021] b) mapping the circumferential edge of the part with a measuring device to measure a deviation between the previous tool path and an actual part profile using the measuring device over at least substantially the entire circumferential edge of the part;

[0022] c) combining the previous tool path with the measured deviation to determine a computed tool path; and

[0023] d) following the circumferential edge of the part with a treating device using the computed tool path, wherein the computed tool path represents the sum of the previous tool path and the measured deviation,

[0024] wherein the circumferential edge of the part is measured and treated; and

[0025] wherein the computed tool path follows the circumferential edge of the part precisely to improve the accuracy of the edge treatment process.